

## THE CLAIMS

What is claimed is:

1. A method of forming a field emission backplate which comprises:

providing a planar body or amorphous semiconductor based material upon a substrate; and

laser crystallising at least a portion of the amorphous semiconductor based material;

wherein upon crystallising the amorphous semiconductor based material a plurality of emitter sites are formed.

2. The method of claim 1, wherein the planar body of amorphous semiconductor based material is provided as a thin film of material deposited upon a substrate.

3. The method of claim 1, wherein the semiconductor based material is silicon or an alloy thereof.

4. The method of claim 2, further comprising the step of performing laser crystallising using an excimer laser or Nd:YAG laser.

5. The method of claim 4, wherein the excimer laser is a KrF laser.

6. A field emission backplate comprising a plurality of emitter sites formed by laser crystallisation of a thin film of amorphous semiconductor based material.

7. The method of claim 6, wherein the semiconductor based material is silicon or an alloy thereof.

8. A field emission device comprising the field emission backplate of claim 6.

9. The field emission device of claim 8, wherein the field emission device is a vacuum device wherein the emitter sites of the backplate act as an emission source in the device.

10. The field emission device of claim 9, further comprising a substrate, a field emission backplate, and an evacuated space and a transparent window, wherein the field emission backplate is formed upon the substrate and the evacuated space is located between the field emission backplate and the thin film transparent metal or metallised phosphor.

11. The field emission device of claim 8, further comprising a wide band-gap light emitting material, into which the electrons from the emitter Sites of the backplate are emitted in use.

12. The field emission device of claim 11, further comprising a substrate, a field emission backplate on one side of which is formed a plurality of emitter sites, a light emitting polymer and a thin film transparent metal or metallised phosphor, wherein a field emission backplate is formed upon the substrate, one surface of the light emitting polymer is disposed on a plurality of emitter sites of the field emission backplate, the thin film transparent metal being disposed on the other surface of the light emitting polymer.

13. The field emission device of claim 11, wherein the device is a display device.

14. A field emission backplate comprising a plurality of grown tips, the backplate being made substantially from semiconductor based material.

15. The field emission backplate of claim 14, wherein the plurality of tips are formed on a thin film of semiconductor based material.

16. The field emission backplate of claim 14, wherein the semiconductor based material is silicon or an alloy thereof.

17. The field emission backplate of claim 14, wherein the plurality of tips are grown in a manner resulting in each having a sharp, pointed shape.

18. The field emission backplate of claim 14, wherein the plurality of tips are grown and etched simultaneously.

19. A field emission backplate comprising a planar member of substantially amorphous material and a plurality of tips of crystalline material thereon.

20. The field emission backplate of claim 19, wherein the each of the tips is formed on a crystalline area of the planar member.

21. The field emission backplate of claim 14 wherein the semiconductor-based material is a thin film silicon based material.

22. The field emission backplate of claim 21 wherein the plurality of tips are formed by the growth of crystalline silicon on a plurality of crystallised areas of the thin film of silicon based material.

23. The field emission backplate of claim 21, wherein the silicon based material is amorphous silicon.

24. A field emission device having a backplate comprising an array of profiled tips formed by the selective growth of crystalline semiconductor based material on a plurality of crystallised areas of a thin film of amorphous semiconductor based material.

25. The field emission device of claim 24, wherein the device is a vacuum device wherein the emitter tips of the backplate act as emission sources in the device.

26. The field emission device of claim 24, further comprising a substrate, a field emission backplate, an evacuated space and a transparent window, wherein the field emission backplate is formed upon the substrate and the evacuated space is located between the field emission backplate and the thin film transparent window.

27. The field emission device of claim 24, further comprising a substrate, a field emission backplate, wide band-gap light emitting material and a transparent window, wherein in use electrons from the emitter tips of the backplate are emitted into the wide band gap light emitting material.

28. The field emission device of claim 27, wherein the wide band-gap light emitting material is a light-emitting polymer.

29. The field emission device of claim 26, wherein the transparent window is a thin film transparent metal.

30. The field emission device of claim 24, wherein one surface of the light emitting material is disposed on the plurality of the tips of the field emission backplate and the

transparent window is disposed on the other surface of the light emitting material.

31. The field emission device of claim 24, wherein the device is a display device.

32. The field emission device of claim 24, wherein the tips of the field emission backplate are of a density of at least 100 per square micron.

33. A method of forming a field emission backplate comprising:

depositing a thin film of amorphous semiconductor based material upon a substrate;

locally crystallising a plurality of areas of the thin film amorphous semiconductor based material; and

growing crystalline semiconductor based material upon each of the plurality of crystallised areas of thin film amorphous semiconductor based material.

34. The method of claim 33, further comprising the steps of depositing the thin film of amorphous semiconductor based material by plasma enhanced chemical vapor deposition.

35. The method of claim 33, further comprising the steps of crystallising the plurality of areas of thin film amorphous semiconductor based material by exposure to at least one pulse of laser interference pattern.

36. A method of crystallising areas of thin film amorphous semiconductor based material for use in a field emission backplate comprising:

forming a laser interferometer by splitting and recombining a laser beam;

placing a thin film of amorphous semiconductor based material in the plane of the recombination of the laser beam;

locally crystallising areas of the thin film of amorphous semiconductor based material by subjecting the thin film to at least one laser pulse wherein the crystallised areas generated in the thin film amorphous semiconductor based material correspond to the interference pattern of the laser.

37. The method of claim 36, wherein for a backplate of amorphous semiconductor based material wherein the semiconductor based material is hydrogenated amorphous silicon, the laser operates at a wavelength of around 532nm to maximise absorption.

38. The method of claim 36, wherein the laser is a Nd:YAG laser.